Mechanical Engineering Design and Research Division

A team of mechanical engineers, designers and technical hands are working in unison to achieve high technology components and systems for accelerators. These include the existing accelerators, Superconducting Cyclotron (SCC) and Variable Energy Cyclotron in the Centre and the future accelerators for the radio-active ion beam (RIB), Facility of Anti-proton & Ion Research (FAIR) and the Fermilab collaboration.

The team has got a high spirit after successfully building the main magnet cryostat and radio-frequency (RF) system for the superconducting cyclotron (SCC). The main magnet cryostat houses the Nb-Ti superconducting coils in a bath of liquid helium at 4 K (-269 Deg. C) and weigh about 12.5 tonnes. The installation of this 2 m diameter cryostat over the 80 tonnes magnet iron with an alignment accuracy of 0.2 mm has certainly been an extremely challenging task.

SCC Cryostat at different stages of design, fabrication and installation

It also took involved effort to fabricate intricate copper components and assemblies for the 12 m tall radio-frequency (RF) cavities that operate at 80 kW maximum power in 9-27 MHz range. The long slender copper components were brazed together with numerous cooling lines and contact fingers, to take away the heat generated during RF operation and to give electrical contacts between components. Both the cryostat and the RF cavities are now continuously operating over the years.
The team is now involved in day-to-day maintenance and improvement of the magnet and RF systems for the superconducting cyclotron. The team is also involved in implementing strategies for beam extraction from the SCC.

The responsibility of the team is extended further into new projects involving design & development of cryomodules for the e-Linac for RIB and 650 MHz cavities for Fermilab / Indian SNS.

Electron Linac for RIB

The team is also involved with the design of large bore superconducting dipole magnets for Energy Buncher of FAIR Project. These magnets have usable aperture of +/- 380 mm in horizontal and +/-120 mm in vertical direction, in which the magnetic field quality of +/-1.5 x 10^-4 has to be ensured over all the operating field range (0.15 - 1.6 T).

The team is equipped with state-of-the-art 3D design software, rapid prototyping machine and FEA tools enabling ability for venturing into highest technology areas of accelerator development.

Workshop

A team of skilled technicians working in the workshop to primarily support the emergency maintenance work related to the cyclotrons. The workshop is equipped with conventional machines. It undertakes manufacturing of components, with intricate geometry and high precision to meet the specifications and stringent requirements of state-of-the-art components for the R&D needs of this centre. VECC Workshop is being upgraded with the new manufacturing facilities. A CNC Wire Cut EDM Machine, CNC vertical machining centre, CNC lathe and Co-ordinate Measuring Machine have recently been installed and commissioned at workshop.

Some of the important components fabricated by Workshop in recent past
FIXTURES FOR FABRICATION OF DUMMY SCRF CAVITY

Components For Heat Exchanger

Wire Cut EDM Machine Tool

Co-ordinate Measuring Machine